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UNITED STATES COMPETITIVENESS

HEARING

BEFORE THE

COMMITTEE ON APPROPRIATIONS

UNITED STATES SENATE

ONE HUNDREDTH CONGRESS

FIRST SESSION

SPECIAL HEARING

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UNITED STATES COMPETITIVENESS

TUESDAY, MAY 5, 1987

U.S. SENATE,
COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The committee met at 10:04 a.m., in room SD–196, Dirksen Senate Office Building, Hon. John C. Stennis (chairman) presiding.

Present: Senators Stennis and Domenici.

NONDEPARTMENTAL WITNESSES

OPENING REMARKS OF CHAIRMAN STENNIS

Chairman STENNIS. Ladies and gentlemen the time to begin this hearing has arrived, and we will proceed now according to the schedule. This hearing is not measured by the number of members or others who may or may not be in attendance, but the value comes to those that do hear them, but also, and I emphasize this part, they go into a written record that becomes a part of the official record of the committee. It will be used by a number of other people, not only this year, but for the years to come.

This morning, the Appropriations Committee of the Senate has asked two distinguished gentlemen to discuss the issue of U.S. competitiveness. We have asked that they offer their opinions and advice concerning federally funded programs and activities which they believe best contribute to making this country more competitive.

Of course, in this connection, we also want to hear which programs they believe should be altered or eliminated in order to enhance the competitiveness of the United States.

INTRODUCTION OF WITNESSES

It is my distinct pleasure to welcome this morning Admiral Bobby Inman, currently chairman and chief executive officer of the West-Mark Systems, Incorporated. We remember Admiral Inman for his outstanding and distinguished career while serving as Director of the National Security Agency, and Deputy Director of the National Intelligence Agency, and various other governmental capacities.

I would also like to especially welcome Mr. Robert Reich, professor of economics with the John Kennedy School of Government, Harvard University. Professor Reich has written extensively on this topic of com-

petitiveness, and his thoughts and ideas are continually sought by leaders in both government and private industry.

Let me thank both of you, gentlemen, for being with the committee this morning. I look forward to your presentations. As already emphasized, they will be distributed widely through the official part of Washington and beyond.

RECOGNITION OF SENATOR DOMENICI

In a moment, I would like to make an additional brief comment, but first I emphasize the appreciation for the attendance of Senator Domenici of New Mexico. He is a very busy, highly engaged man, with his time and his talent.

Would you like to say a few words now, Senator, before we start.

Senator DOMENICI. A very few, but I would like to say a couple of things, Mr. Chairman.

Chairman STENNIS. You proceed in your own way in an introductory nature.

Senator DOMENICI. Thank you very much, Mr. Chairman.

INTRODUCTORY REMARKS OF SENATOR DOMENICI

First, I think you make an excellent point that we are very interested in what these two distinguished gentlemen have to say about this notion of competitiveness.

As I understand it, neither witness has prepared remarks but both are going to talk with us about this issue. I hope they understand that the U.S. Congress is gobbling up this word "competitiveness" like nothing I have seen in decades. It is the latest buzz word. It has no rival at this point.

I don't think that a major piece of legislation is getting out of any committee of late that doesn't have something that allegedly addresses the competitiveness issue.

COMPETITIVENESS ISSUE ON TRADE BILL

Just adding to the discussion, we have a trade bill coming through Congress that sounds like it ought to be related to the issue of competitiveness, especially since we are concerned about the trade deficit. The trade bill provides for three new technology transfer centers.

I don't know that anybody knows what they are really going to do, but we are angry that we aren't successfully transferring technology to private industry. We took all of the labs' technology transfer activities, and we moved them to Washington 18 months ago. Now it appears that somebody has come to the conclusion that that isn't working, so the trade bill authorizes three new technology transfer centers.

COMPUTER COMPETITIVENESS

The trade bill has about eight sections in it on computer competitiveness. It amends the Higher Education Act, because apparently somebody thinks that we ought to change in a very specific way one aspect

of how we fund universities, and the trade bill provides some more funding for that. We have $90 million in there for a new series of competitiveness grants that are supposed to go to universities in the area of computers and high tech.

I only give you that background because I think the distinguished Chairman of the Appropriations Committee has one of the toughest jobs around. Eventually, the appropriators in one subcommittee or another are going to appropriate some money this year for competitiveness initiatives.

NATIONAL LABORATORIES

The President of the United States is involved in it. In the state of the Union message, he has 15 new, so-called, centers of scientific excellence. I was amazed to read that document. While I laud the effort, I saw no mention of the national laboratories in the entire presidential proposal attached to his speech to the Congress. So we are going to create 15 new centers, and not a mention of the centers that already exist.

We spend about $8 billion on publicly-owned laboratories, three of which are nuclear weapons related. Each of those three spends almost a billion dollars annually. Each of these is multi-disciplined and have the finest equipment in the world, and probably as good an array of scientists as you will find anywhere.

I think Admiral Inman would agree that national laboratories like Los Alamos, Sandia, and Lawrence Livermore, are indeed national treasures and national assets of high, high significance in terms of their accumulation of scientists.

MATCHUP OF TALENT AND PRIVATE SECTOR

Frankly, I think we need your help. I think that we have to find out from somebody how to use the talent that is out there and link it to the private sector in some way. I don't think that we need an awful lot of new institutions.

It seems to this Senator that we need some way to take the talent that is out there in the various fields of science, in basic research, and find a new way to expedite its evolution into the marketplace into products that are needed, that are driven by demand.

I don't know if anybody suggested anything yet, other than that we try a whole batch of new things. I have concluded in my own mind that we must in some way find a better marriage between the private sector, the universities, and the national laboratories, to the end that that talent finds some synergism that yields new products and new ways of doing things from science.

I am firmly convinced that that is what we have to do. It is an institutional thing, but it is not necessarily scores of new institutions, but rather an institutional shortcoming of a great system.

I thank you very much, Mr. Chairman, and I look forward to their testimony and observations.

Chairman STENNIS. Thank you. I am certainly glad that you can be here, that you found time to come to this hearing.

I have a few remarks initially, and then we will proceed.

REMARKS OF CHAIRMAN STENNIS

Every day we are reminded as a nation that we have now accumulated a national debt of over $2 trillion. In addition, over the past few years, our international trade posture has gone from being a creditor nation to the world's largest debtor, with an imbalance of over $160 billion.

With our current budget constraints and our efforts to reduce the Federal deficit, it is crucial for Congress to insure that our citizens are able to both learn and earn so that our standards of living will not diminish more than is absolutely necessary.

We must maintain the productive ability of our workforce to insure sustained economic growth and security into the future. New technologies and successful economic development strategies abroad have created a fundamentally new and highly competitive challenge for the United States.

The President's Commission on Industrial Competitiveness found that our ability to compete is eroding, threatening our world leadership and our standards of living. My hope is that we can turn this trend around in order that our Nation can become productive and prosperous.

Now I would like to turn to our experts and hear what they believe should be done.

Admiral Inman, I hope that you can begin now, and then we will hear from Professor Reich later. So that we can understand exactly what we are discussing this morning, could you begin by giving us your definition of what making this country more competitive means?

What do we mean when we use that term? It is something that we have to learn more about here, and our people and our leaders of all groups must learn and have more understanding of this condition, and the term that we use to describe it, the methods that we are going to use.

I have long had a strong conviction that, by the nature of things, self-government can only continue to control and be an answer to the problems if we have a good and strong economy. When we fail, then the effectiveness of self-government, self-control in government, very rapidly diminishes.

All right, gentlemen, let me emphasize our welcome to you, the confidence that we have in you, and the firm belief that you will make a contribution.

Admiral, you may proceed.

WESTMARK SYSTEMS, INC.

STATEMENT OF ADM. BOBBY INMAN, PRESIDENT OF WESTMARK

AMERICA IN THE INTERNATIONAL MARKETPLACE

Admiral INMAN. Thank you, Mr. Chairman, you do us a great honor, inviting us to appear before the committee this morning.

WestMark is a brand new enterprise. I am operating on a very frugal pattern until we bought some companies and have some income, so I am not yet in a condition to produce formal statements or to come with good graphics for the briefings. I know that the chairman likes good graphics in the presentations to the committee, I apologize that I don't have any this time, but hopefully if you ask me back a year from now, I will be in better shape.

You know very well that I spent 31 years of my life looking at the outside world. I have now had almost 5 years to look intensely at my own country. These are still shallow views, and the opinions are clearly subject to challenge, but at least I have developed some strong opinions out of that 5 years of looking intensely at my own country.

For much of that time, I have been trying to understand the issues that are now pulled together under the title competitiveness. My worry has been not what do we do to the outside world, and I know that there are things that we need to do related to the outside world, to insure fair access to markets. But my focus in these now almost 5 years is what do we need to do at home to adapt to the reality that we are now part of an international marketplace.

We developed a great economy with all kinds of institutions that help govern, funds supported, but they were all focused on it being a domestic marketplace. Beginning in 1960, we made conscious efforts to open up this country and to integrate in that international marketplace under a broad belief that that was the way to insure long-term economic growth.

I don't find fundamental fault with that, but I believe that we did not think through the changes we needed to make at home to insure we could compete at that international marketplace. In fact, we went the other direction in a number of our institutions, of continuing to approach problems as though we were still living in that world where we simply were fueled by a great domestic economy.

U.S. STANDARD OF LIVING

I am absolutely persuaded that what we are really talking about here is a standard of living for American citizens. I have been impressed by the fact that this economy has continued to create new jobs, but as I have looked very closely at those new jobs, partly through a separate hat that I have serving on the board, and now Chairman of the Federal Reserve 11th Region Center in Dallas, I have come to understand that of those in excess of ten million new jobs created over these last 5 years, the average weekly wage is $272. In that same time frame, we

have lost 1.2 million jobs out of manufacturing, and another 400,000 out of mining, where the average weekly wage was $444.

Even accepting that American citizens may have been overpaid as compared to their productivity, the reality of a declining standard of living for a lot of our citizens is clearly to be found in those statistics.

I believe we have to look at this economy very seriously in saying not how do we shut out our participation in international markets, but how do we insure that we can be competitive at that market, and insure that we sustain the standard of living.

IMPROVING PRODUCTIVITY

I am not prepared to sign on to those who would say that we just should accept a declining standard of living as our way to solve the problem. I do believe that the central challenge to us is improving our productivity. It is not just productivity of industry, but it is productivity across government, and across our various institutions.

We used to lead the world, and that was one of the ways we could sustain a higher salary, wage basis. I am told that for this last year, if you take the financial services, the managing and creating more debt, that we didn't have any increase in U.S. productivity over the last year. This has led me to focus very much on technology, on creating technology, on applying it, on marketing it.

TECHNOLOGY KEY FACTOR IN U.S. COMPETITIVENESS

Again, I am going to defer on a lot of these issues to Professor Reich, who has studied them in so much greater depth than I have. But, at least from my shallow look, I am persuaded that technology has been the fueling element of the growth of this country's economy. That its real grounding of moving from being an importer of technology comes with the Morille Act in 1862, creating the Land Grand Colleges, followed on in that same year by the creation of the National Academy of Sciences.

U.S. GROWTH FROM 1865 TO 1940

The great growth from 1865 to 1940, first in the universities, public and private, then as the country grew, the economy prospered, large corporations came into being, and industrial laboratories. Then, most importantly, the creation of the National Laboratories.

By World War II, we had the broadest base for pushing the frontiers of science to be had anywhere. But we didn't have a real sense of urgency about turning the fruits of that science into usable technology in a timely way.

You know well that World War II changed that to a sense of urgency to produce weapons to win a war. It also solved a lot of other problems. We had to deal with scarce raw materials. Out of that effort came such things as synthetic fibers and the first large scale computers, often forgotten in our focus on the weapon systems that were created.

POST-WAR YEARS DEVELOPMENT

In the immediate post-war years, 1946 to 1960-61, we greatly expanded our ability to create new technology and to apply it. We began to lose some of the sense of urgency over those years. But I am persuaded, in playing historian and looking back over that time frame, that there are some lessons for us that we need to dwell on in looking at what is the role that government can provide and where things will have to be done in the private sector, out in the academic community.

NO-GROWTH IN FEDERAL GOVERNMENT

I am persuaded from these five years of roaming all over the country, first in the site selection for my last activity, the joint research venture MCC, and on-going dialogues, that the country at large does not support substantial growth in the size of the Federal Government.

As you well know, this country was founded by people who didn't trust government, and who wanted government as close to those being governed and less specific functions to the Federal Government. Then we went through a great depression and a global conflict, then I think that all of us came to look at the Federal Government as the creator, the inventor, the initiator of new approaches to solve all of our problems.

I remain persuaded that the Federal Government has a critical role to play, but I don't believe that the public at large would support an approach that said, you go create large new agencies, large new organizations, as the way to try to solve the problems.

That perception has led me, in my responses to you, to focus on how do we make advances with what we already have. How do we get better use out of programs that exist, rather than how do we go create new organizations or new structures or new entities to try to do the job.

CREATING, APPLYING, AND MARKETING TECHNOLOGY

I, then, have turned from that perspective to my three areas of creating technology, applying technology, and marketing it in an effort to respond to the committee's interests.

I must also apologize, Mr. Chairman. I realize, with these 5 years out in the private sector, I haven't been tracking Federal programs very well. So for your specific request—what programs should you fund or not fund—I am not a very good witness, but I will still hit some of them as I go through this path.

CREATING TECHNOLOGY

On creating technology, clearly, spurring investment and research is a proven track record as you look back over our history. Over the times when we have had spurts in investment research, we have ultimately seen significantly forward, though not always as fast on the economic side as we have sometimes seen in government applications.

I am persuaded that the R&D tax credits that were enacted as part of the Economic Recovery Act of 1981 have had a positive effect. In-

dustry's investment in research went up during the 1982 recession, and not down. As best I can track it, it is the first time in our history.

As you know, the R&D tax credits are going to expire at the end of August. I believe that making them permanent, going back to 25 percent, is a positive thing to do.

I am told that the rules that Treasury has put in place would encourage some of that R&D overseas. I don't think that that is wise. I do believe that we need to focus the funding that government does undertake in how do you expand the pool of talent.

My old friends in Defense probably are not going to be very happy with me. I am not talking about adding to the Defense budget, but I think we ought to look very seriously at earmarking a significantly larger amount of what they call 6.1 basic research funds for unconstrained grants for graduate studies in science and engineering. I believe that that ought to be done with minimal bureaucracy.

I have looked back at the period of the late 1940s and the 1950s. I was out at Los Alamos for a conference about 2 years ago that drew scientists from all over the country, and I asked that group of scientists how many of them had support from the Office of Naval Research, or its counterparts, in getting a doctoral degree. More than half of those present, and there were 400, raised their hands.

In those days, a scientist from the Office of Naval Research went out to the campuses, looked to see if there was unique research. If they decided that it was unique, they didn't know how it might be used, they sat down and wrote out a voucher to support the student through the dissertation. This was the extent of the bureaucracy, not endless hours applying proposals, and shopping them to various agencies to support them.

It involved trust. It may have involved some waste. But in broadening the pool of talent to go and tackle a whole range of issues, I believe the country at large was well served. I think that we ought to revisit that approach, with minimal bureaucracy in looking out ahead.

There are a number of proposals for government funding for new construction, for expanding research facilities in universities, for new equipment. I am basically supportive of them, but frankly I would like to see us leverage them. So I would encourage you to look for language that makes those matching grants, and say yes, the government will look to put up some more money for cooperative centers, for new equipment.

It is clearly needed, but we ought to leverage industry into doing more and say that what the Federal Government will do will match grants that are raised from the private sector, from philanthropists and from industry itself.

APPLICATION OF TECHNOLOGY

On the application side, this is where my worries are the highest. I am basically encouraged by a lot of the activity I see in accelerating our focus on creating new technology, but I really worry that we aren't spending nearly enough time thinking through how do we use that technology in a much more timely way.

I look at our Japanese colleagues, and they don't have that broad base for creating research that we have. They are working at building it, but they haven't had it. So they bring a very different approach.

They know that the technology may already be 1 year, 2 years, or 3 years old before they can get their hands on it. So from the beginning, their focus is how do they use it fast, and do they use it with absolute quality controls.

We need to try to put in place incentives for focus on modern, flexible manufacturing technology. How do we, in fact, insure that we get the productivity out of U.S. manufacturing that let's us sustain a viable manufacturing base?

In my government days, and again now in these five years in the private sector, creating technology is easier than getting it transferred. Getting people to use new technology is just plain hard. It is a human process. You have to get people excited about the potential of using it. I have a lot of reluctance about launching off to create a lot of new centers, or a lot of government agencies.

The difference between the Agricultural Service that was so successful in our early days and now is that we have modern means of communication and transportation. In the late 1800s, we had to have the county agent go see the farmer. The farmer couldn't come to observe the new means, so you had to take it to them.

I am not persuaded that that is the case now. I think that what we have to focus on instead in our existing institutions, the universities, the national laboratories, what vehicles do we have in place to help the private sector, and particularly the small business sector, understand the opportunity and get early access to technology that is being created for unique applications.

We do need to put some effort on understanding the application of technology abroad, and here we are hampered by the fact that few Americans speak foreign languages. So this is an area where government effort to get translation of scientific documents from abroad, particularly Japanese, could be beneficial, but I would like to suggest to you that we ought to try to see if we can't get the Japanese to pay for those translations and make them available to us, and then let the government work on the distribution process.

The real key is the shortage of linguists. The Japanese are doing an awful lot of exciting things, and they print a lot of documents in Japanese from which we could learn.

There is a model here in this town, the Foreign Broadcast Information Service, where there is a pooling of resources to translate information related that is useful to us from the intelligence side. We need to do something on the translation of scientific documents and the access to those that will let us learn from abroad.

PROCUREMENT

Let me venture off into an area on applications that is going to be very contentious, again, with my former colleagues in Defense. But my comments here really apply to the Department of Defense, the Department of Energy, and NASA.

As I look back at the period 1946 to 1962-63, we had a procurement cycle that ran 4 to 5 years. We worried about its efficiency. We worried about cozy relationships. But because that cycle was 4 to 5 years, the technology that evolved from their investment became available for potential commercial exploitation at an early point in time.

We set out to try to improve our management of the procurement process, and I don't find fault with those who set out to do that. They brought broad techniques from industry, they applied them. Cost effectiveness became the standard.

We increasingly were concerned about competitiveness, competitiveness among U.S. firms. We were concerned about flying before buying; testing before buying, a whole range of issues to try to perfect to avoid mistakes.

I think that it is time that we stand back and say, on balance, what have we gotten and what are the consequences? I am not persuaded that on balance we have a better procurement process than we had when the focus was on 4 to 5 years.

I am persuaded that we lose the potential for early commercial exploitation of much of the research efforts that flow out of that investment in Energy, in Defense, in NASA, and particularly in the national laboratories that support much of that activity.

I think that it is time that we take a whole fresh look at whether accepting some mistakes may be preferable to a process that denies early availability of that investment for commercial exploitation, accepting the reality that we are now and are going to be an international marketplace.

MARKETING TECHNOLOGY

Finally, on the issue of marketing new technology, I will be brief because I know very little about it. This is not an area where I have worked very much. But, Mr. Chairman, I have developed some strong views in two areas related to that, and one is our need to fund area studies, cultural studies, and languages.

I am persuaded that if we are going to be successful out in that Year 2000 at that international marketplace, we are going to have to understand other countries a lot better than we understand them now. We are going to have to tailor our product to be successful in those cultures, and we are going to have to market in the language of the country where we want to sell.

Our principal political and military allies are going to be our principal economic competitors, and they are going to be out there marketing in the language of the country where we want to sell.

QUALITY ISSUE

The second issue on marketing is quality. As I look at the efforts to get the value of the dollar down and see its substantial success against the yen and the mark, and still look at the whopping trade balances, the only rational conclusion I can find is that the American consumer is willing to spend more for what they judge to be better quality products.

If I am even close to right in that explanation, we are not going to regain a significant share of this market until we have both the reality and perception that the quality of American products is not exceeded anywhere else.

So we have to look for incentives for quality, and I think we do that in looking at Federal programs as a model, not as a way we deal with it, but look at our own Federal procurement process, that is to say, do we put an emphasis on quality or is all the dialogue on what is the cheapest approach as opposed to what is going to last for a long term, and return value.

VALUE OF EDUCATION IN COMPETITIVENESS

There is another strong impression I have from these 5 years of roaming the country, and it is that in this whole issue of competitiveness that education is the frontline, because indeed what we are really talking about here is what do we do with the human resources of this country to ensure that we have the productivity that let's us be successful in the international marketplace.

Much of the cost of what has to be done in education is going to be done at the State and local level, not at the national government. But I do think that we have to look at, from the Federal level, where do we do demonstration activities.

How do we help get down the cost of software programs for English language literacy right at the beginning of youngsters entering school?

I still think that we ought to watch how we get people to take pride in their culture and their heritage, but English is the language of the marketplace. Unless we ensure that every citizen is literate by the time they are out of the first grade, we are automatically saying that they are going to have limits in the job they can hold, and how they are going to do in that marketplace in the years ahead.

I think that in baccalaureate education, we need more breadth, and not specialization. You already know, I think, in the graduate area, I believe we need a lot more grants for graduate studies.

Bright U.S. youngsters will stay on for graduate studies when grants are available. They will not stay on on borrowed money. When the country did those grants, we prospered in the overall breadth of the base, and we ought to look very seriously at that again.

CONTINUING EDUCATION

Two areas that I would focus on that I think the government may be able to play a seed money role, one is in continuing education.

Given the pace of change in technology, we need to be able to deliver to the workplace continuing education. Not only do we need to involve the universities in that, but we need to involve the national laboratories on that. They are great pools of talent.

We need to look at the way we make accessible via television, via computing system, the ability to provide continuing education. Once we get it in place, industry ought to pay the on-going bill for the service they are getting, but there is some investment to get it in place.

TRAINING

Then, finally, training and retraining. I am persuaded that we have got to put a lot more focus on how do we give individuals just out of high school, and later as they are displaced, how do we give them the very specific skills they need to be successful in a new job in a minimum time frame—3 weeks, or 4 weeks, not 9 months, or 2 years, for certificate programs.

I think that we already know how to do that from some of the investment that you and many others have made over the years in defense. When we have an all volunteer force, the Air Force no longer got those bright high school graduates avoiding the draft. They suddenly got youngsters who may have a diploma, but who are barely literate. They had to focus on the use of computing and television to take barely literate individuals and turn them into first rate aircraft engine mechanics.

They were successful. The programs work. We don't need new technology. But we need to get in place the ability to train and retrain workers who are already displaced and who are going to be displaced as a critical way of insuring that a larger percentage of this population is in the workplace and that they are productive.

Thank you very much.

Chairman STENNIS. We thank you very much, indeed.

I am going to call on Senator Domenici now, from New Mexico for any questions he may want to ask.

Senator DOMENICI. Mr. Chairman, I would yield to your judgment if you want to hear the next witness. I can be here with you until noon.

Chairman STENNIS. That is a good suggestion. I was afraid that you were going to have to leave.

I have already introduced this gentleman. You proceed now in your own way.

JOHN KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

STATEMENT OF PROFESSOR ROBERT REICH, PROFESSOR OF ECONOMICS, JOHN KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

U.S. LIVING BEYOND MEANS

Professor REICH. Mr. Chairman and Senator, competitiveness is one of those words that has gone from obscurity to meaningless without any intervening period of coherence. But I think, underlying the issue, is one simple fact that is becoming more and more pressing, and that is

that America is living too high on the hog relative to our ability to produce.

Last year, we produced as a nation around $800 billion more than we produced in the recession year of 1982. That sounds pretty good, but last year we also spent as a nation around $900 billion more than we spent, in the public and private sector, in the recession year of 1982.

We are living beyond our means. If present trends continue, we are going to go into deeper and deeper debt to the rest of the world. Estimates, I think fair estimates, by 1992-93, are around $1 trillion. The interest payments to the rest of the world on that international debt are going to consume a larger and larger portion of our GNP.

IMPROVEMENTS NEEDED IN U.S. PRODUCTION

The fundamental problem is not access to the Japanese market, or access to other markets. That is a small piece of the problem, that is not the center problem. I worry, and I will get into matters that will be before this committee in a moment, but I worry that the current concern with access to foreign markets, and with so-called "fair trade," is diverting the public's attention from what are much more basic pressing problems here at home having to do, as Admiral Inman said, with productive improvements, with becoming capable in our private sector of producing the goods and services that will sell in the rest of the world.

Senator DOMENICI. Mr. Chairman, might I ask a question?

Chairman STENNIS. All right.

Senator DOMENICI. Doctor, in your statement you refer to access to the Japanese markets. You probably are up on almost every bit of research with reference to that statement which permits you to make it with such certainty.

If you want another document that proves that that statement you made is true, Congress's own investigative arm, the GAO, was asked to check in Japan as to how much of our trade balance is due to so-called "unfair competition" or closed markets. I will bet that you could guess with me what they found—5 percent of the trade balance, they said. Obviously, you are right, nobody wants to believe it, so we keep talking about something else.

Professor REICH. It is easy to find scapegoats. I think there is a cultural resistance in Japan to buying American or foreign products. It is possible to erode that cultural resistance over time, but simply banging them over the head is a doubtful remedy.

I might add, parenthetically, that by my research, about 30 percent of the trade imbalance is attributable to American corporations either buying Japanese components for their products, or producing in Japan and selling back to the United States.

INVESTMENT

If the access to Japanese markets or access to foreign markets is not the basic problem, it seems to me that the basic problem is investment. If we were going into that for the rest of the world, and investing that

indebtedness, it would be all right. It would be like any individual or any family going into debt, or in business, investing that in the business, and it is perfectly fine because you become more productive in the future.

The problem is that we are not investing that indebtedness. We are consuming. The public sector, the private sector, we are consuming that indebtedness. I think that the challenge before us, the fundamental challenge, and, indeed, the fundamental choice, is very simple, very straight forward, it is one that we don't want to face.

INCREASE IN U.S. PRODUCTIVE CAPACITY

The choice is that we either become poorer as a nation or we become more productive, and we invest for the future. That is the simple choice in front of us.

I would opt for the second choice, as I think most of us would. Then the question becomes: How do we become more productive? What is the problem? What are the impediments to becoming more productive and more productive internationally?

I want to talk briefly with you about two aspects of that challenge that will be before this committee. One has to do with education and training and dislocation, and the other one has to do with research and development.

EDUCATION AND RETRAINING

Congress and the President will probably be considering anywhere from $800 million to $1 billion in funds that will be allocated for dislocated workers for retraining. It seems to me that that could be an investment and money well spent, making the worker in the United States more flexible, more capable of getting another job quickly, of giving him or her the kind of training he or she needs to progress from job to job.

It will cure one of the basic problems in our labor market right now, and that is the stickiness, the inflexibility. It is very hard now for workers to get easily the kind of retraining they need, the kind of relocation assistance they need in the kind of flexible world in which we are going to be living, in fact, in which we are living.

The average worker is going to go through six or seven jobs in his or her lifetime, working through four or five major companies or businesses in his or her lifetime. That kind of retraining or reeducation is going to be something that he or she is going to need, and he or she, very often, is not going to have the wherewithal to undertake for him or herself.

The problem, though, as I see the issue, and this is a very specific issue, but it will be before this committee, the question is how you administer that money. I do not believe it is a wise use of the funds for that money to be distributed simply on a pro rata basis or another sort of formula to cities, to mayors, to private business councils. That is going to be too little, spread too thinly. It is not going to provide the kind of targeted, flexible, immediate assistance you need.

In my judgment, and I will be happy to talk about this with you at further length, the best recipient of that money, which will maintain flexibility and also the ability to respond quickly to a whole variety of different dislocation problems is State government. At that level, the States have the wherewithal, the institutional capacities, the experience, the flexibility, the immediate responsiveness to handle that kind of money right now.

RESEARCH AND DEVELOPMENT

Let me move on to research and development. The theme I want to stress with you is that the United States, for the past 40 years—and Admiral Inman touched on this—has been extremely capable at basic research. We have undertaken the basic technological breakthroughs and we will continue to undertake them.

I am talking about very large scale integrated circuits, semi-conductors, automobile stamping technology, continuous casters for steel. You name it, we probably developed it.

Our problem has come in turning these basic inventions into terrific products. More often than not, we have licensed a foreign company, usually, these days, in the past 10 or 15 years, the Japanese, to take our technology, produce it into terrific products, and then it comes back to us, either as a finished product or in pieces that we just assemble, and then resell to our people.

There is pressure growing in the United States to keep our technology here for ourselves, and not let them have access to it. The administration discouraged Fujitsu from trying to purchase Fairchild Semi-Conductor. One of the bases was that Fairchild was a company, a major progenitor of American technology, we didn't want that falling into foreign hands.

The Defense Science Board of the NFS have recently completed studies purporting to show an increasing danger of relying upon foreign technology. Malcolm Baldrige has recently gone on record as saying that there are strategic industries for the economy that we don't want to fall into foreign hands and, therefore, we have to protect American technology.

There is a trend. I think it is dangerous, because it doesn't address the fundamental problem. The problem is not that they are running off with our inventions. The problem is that we are not fast enough, good enough to transform our inventions into terrific products.

We have a lot to learn from them about how to do that. I would say, by way of footnote, rather than forbidding Fujitsu from coming in and buying Fairchild, we should have invited them in. We should have said: Come in. Teach us how to do it. Teach us how to make better products, better integrated circuits, advanced circuits more quickly. We ought to be saying that much more these days.

SUPER-CONDUCTIVITY

Super-conductivity, the latest sub-buzz word underneath competitiveness, everybody is talking about it. Time Magazine, this week, has a cover story on superconductivity. This is a good example. We played a major role in inventing, in producing the basic breakthroughs leading to basic super-conductivity, but already there are signs that the Japanese are organizing, both private sector and public sector, to take advantage of those breakthroughs.

I might add, this is not a matter of heavy-handed government involvement in Japan. The Ministry of International Trade and Industry is not providing Japan with huge amounts of money. In fact, in our GNP basis, our government provides our industry with much more research funding than Japan provides Japanese industry.

What the Japanese government is doing is simply helping private industry organize research joint ventures, helping reduce the transaction costs of getting together, of finding what those critical levers might be to transform super-conductivity technology into new products. They have been doing it since February.

American industry is spotty. Certain companies that I have interviewed in the past several months are beginning to try to see applications. What I get from many research directors in many companies, however, is the same story. We are watching it. We are looking for possible applications. We are watching the situation closely. But we are watching. The verb is "watching." They are not actually taking action. There is no concerted action.

ACTION ON SUPER-CONDUCTIVITY BY DEFENSE DEPARTMENT

There is only one place in government that is taking active, strategic action with the private sector with regard to super-conductivity at this moment. I will bet you know where that is—it is in the Defense Department. It is in the office related to the Strategic Defense Initiative.

Unfortunately, and I say, unfortunately, advisedly, the Defense Department is where most of our strategic application technologies, in terms of government involvement, have occurred over the past many years.

The Defense Advanced Research Project Administration, for example, has been the seedbed of applications engineering, of transference, of basic technological breakthroughs into the private sector. It seems to me that we have to aim to get this out from under the Pentagon for a variety of reasons, some of which Admiral Inman touched on.

One of the major reasons these days is that the spinoffs are now less readily available than they were when many of these technologies were early generation. The bang for the buck that we get in terms of spinoffs very often are simply not there. Also, many of these technological applications are classified. It is more difficult for American entrepreneurs to get access to them.

So in terms of applications, and here I agree 100 percent with the Admiral this is a focus of our problem, transferring basic invention

quickly into terrific products. I would say that we have to focus on three particular things.

One would be, as I said, trying to get some of this applications engineering funding from under the Pentagon. Some of the work now undertaken by various offices in the Pentagon, ostensibly related to Star Wars or other related technologies, is basically applicable to commercial technologies as well. There is no reason that it has to be administered by the Pentagon.

RESEARCH JOINT VENTURES IN PRIVATE SECTOR

Second, I would say that we could encourage, through public policy, research joint ventures in the private sector. Admiral Inman spent many years, I think, with an extremely exemplary program of research joint ventures, MCC.

Research joint ventures with matching grants, perhaps on a 50/50 basis, perhaps on a 20/80 basis, with the United States to provide the kind of seed money that those research joint ventures need to apply, very readily, very quickly, those new inventions to applications.

TECHNOLOGY EXTENSION

Third, and this is where I depart a bit from Admiral Inman, I think there is, with regard to our small business community, still some potential utility in technology extension. I have talked to many small business people over the past 5 years. Small businesses, although they know vaguely that there is a technology out there that might suit their needs, they don't have the kind of access they need.

They need demonstration projects, roughly analogous to the Agricultural Extension Service. This is not a major program. This is not big money. It is just a matter of getting word out, providing a little bit of funding, maybe a loan program, or some other funding device that enables small businesses to rapidly incorporate those new technologies.

As the committee is aware, small businesses are not only creating most of our jobs in America, they are also doing much of the applications engineering that is going on in the United States. In fact, the only portion of the manufacturing community that has grown since 1970 is small business, much of it in the applications area of the sort that we are talking about.

Senator DOMENICI. Mr. Chairman, might I ask a question?

Chairman STENNIS. All right.

SMALL BUSINESS EXTENSION

Senator DOMENICI. What does small business extension as you have just used it mean? Can you elaborate?

Professor REICH. I am talking about technology extension, Senator. I am talking about a variety of things. One would be demonstration projects so that small businesses in various areas, various locales, can actually see and test, in a rudimentary sort of way, how new technologies, particularly capital goods and equipment technologies, can be applied to their particular business needs.

A second program, and this is used in Japan and many other countries, would be either a loan/grant program, or some similar device, in which small businesses can try out new capital goods, new applications of technologies. Often what holds them back is the fear that it is just not going to be good for them.

They don't want to make the huge downpayments, the huge capital costs, if they are not going to get the payback. The fear of the unknown is what holds back many businesses from new capital goods, new technologies.

Thirdly, I think that it would be helpful if there were a set of programs with regard to Small Business Extension, analogous to the Agricultural Extension, that would enable small businesses to pool some of their resources in a geographic area, to come together in applied research joint ventures, which might enable them, again—something like SemiTech that the semi-conductor industry is now trying—to do process technology trial runs to see if there are new ways of manufacturing, new ways of incorporating manufacturing technologies on a small batch production basis that could be quite profitable. But they have to see it before they are going to believe it. Even trying it out in their own small business doesn't give them the scale with which to see the possibilities.

Again, I am not suggesting any massive new program. I am suggesting that we target. We understand what we need. One of the problems in this area of competitiveness is that it is a coat-hanger. Everybody puts their favorite wardrobe on it and tries to cloak everything in the garment of competitiveness.

BASIC IMPEDIMENTS TO TARGETING

I think there are three basic impediments. We have talked about two of them: dislocated workers and the flexibility of the workforce. The second is that gap between basic invention and applications. The third is primary and secondary education, but again, for reasons that Admiral Inman suggested, I will not get into that at this point.

Thank you very much.

GENERAL QUESTIONING

RESEARCH EXPENDITURES

Chairman STENNIS. Professor Reich, we thank you very much.

Senator Domenici, we will come back to you now. You have some questions, I am sure.

Senator DOMENICI. Thank you very much.

In my brief opening remarks, I generalized about the Federal Government's expenditure in research. I would now, for the record, and for my question, make it more specific.

From the research I have done, the Federal laboratory system in the United States, if there is one and I use the term very loosely, is a collection of 388 research institutions. Some of them are designated national

because of their multi-purpose charter. Interestingly enough, most of those that are national started out with a very specific mission—nuclear deterrence.

These labs employ 250,000 people. If my research is right, the United States spends $61 billion annually on research, approximately 70 percent of which is devoted to defense, 10 percent to health, 7 percent to energy, and the rest to general science, at least as we designate their effort. It doesn't mean that the multi-purpose scientists, if we put them under defense, are doing only defense work.

NATIONAL LABORATORIES

I wonder, and I would like to ask both of you, as this Congress attempts to set up some new institutions to utilize our basic science better in applications, in joint ventures, or in consortia, if you would care to suggest to us whether we ought to seriously consider these national labs, or some of them, as part of those joint ventures and/or consortia, or whether we should limit that to the universities in the private sector as presently suggested in the President's proposal for centers of excellence and most legislation that is running through the Congress?

Professor REICH. Senator, I think, unequivocally, that we have to use the national laboratories not only because they represent so much money and so much investment, but they also represent an accumulated experience in many of these science and technology areas that we need to tap.

I can't stress enough with the committee the importance of experience. We have in this country, right now, in basic science in applied areas, a certain amount of science and technical and engineering experience. We have to build on that experience with regard to commercial competitiveness, and also with regard to defense preparedness.

I would say that it would be a tragic mistake to leave these 250,000 employees out of that process, and also the accumulated organizational experience that those laboratories represent. To my mind, what we need to do with regard to our technological development is to use the universities, use the private centers, use the national laboratories, and come up with a way of integrating what we have in all three so that we are not simply reinventing the wheel, so that those universities, private centers, and also national laboratories, in rough geographic proximity, can build on each other's strengths, so that, again, the experience base that we have is not lost, that we take maximum advantage of that.

GOVERNMENT'S ROLE IN COMMERCIAL AND ECONOMIC DEVELOPMENT

To do so requires a slight change in not only our organization, but also a change in our thinking about this matter. For too long, in my view, we have, in this country, been very reluctant to talk frankly, clearly, explicitly, about commercial development, economic development, about government's role in commercial and economic development.

We have tended to use the pretext of national defense. I am talking not only all the way back to the World War, but also the Highway Act of 1956, you will remember, we called it the National Defense Highway Act, pretended that it was all about getting munitions from Boston to San Diego; the National Defense Education Act, after Sputnik, terribly important for training a whole generation of scientists, teachers of foreign languages. We talked about it as though it was only to be catching up with the Soviets.

Even now, as we worry about our falling behind the Japanese in micro-electronics, most of the public explicit concern has come out of the Pentagon—The Defense Science Board, the NSC. These are equally, if not more, important to our commercial development.

Our national laboratories, you said, spend about 70 percent on defense, ostensibly on defense. I would bet that actually an awful lot of that expenditure has direct commercial applications, and we ought to be quiet about what we are doing and when we are doing it.

Thank you.

Senator DOMENICI. Dr. Inman.

Admiral INMAN. Senator Domenici, I strongly support the much deeper involvement of what we call the national laboratories as a large group in this process. They are an exceptional group of institutions. They have been able to draw together superb scientists, and because of their nature, focusing on long-term problems, they have been able to hold on to those scientists even when they don't pay as well as the private sector does, because of the ability to work on the long-term problems.

I have some sense that over the last dozen years or so, they have become a little less relevant to the on-going problems. They have sort of been pushed aside. They are not pulled in to as much engagement in helping solve a whole range of on-going problems.

MODEL PROGRAM FOR NATIONAL LABORATORIES

I would like to see a model program, involving the national laboratories, focusing on the issue of manufacturability of new defense problems, where we begin by saying, focus on ease of manufacturing, speed of manufacturing, and the ability to replicate that same cost—I am thinking of the whole spare-parts problem.

The key here is to mandate that the results of that activity be widely available for commercial use, particularly in the small business community, as quickly as it is done. It is a way that you can get early focus on a problem that needs to be solved.

If I may load on your question simply to say that I am in very comfortable agreement with Professor Reich's concluding comments on some kind of technology transfer mechanism that helps focus on the small business. I guess I am not as familiar with Agricultural Service as I thought I was.

I am not at all opposed to investment to try to get at that problem that he has well-defined. I just have some skepticism about whether creating another bureaucracy will do it. If you can establish for me that it is really going to get at that problem, then I would support it with no problem.

Senator DOMENICI. I want to share with the two of you, and for this record, two experiences that I have had recently.

First of all, it is interesting that the defense research group that looked at semi-conductors did so because they were worried about our growing dependence. They have concluded, as you have, Doctor, that while that dependence is an issue, it is patent that we are going to lose the next, and the next, and the next generation of telecommunications equipment on the civilian side.

They just happened to find that because they were charged with finding out why we were growing in dependence on semi-conductors for defense, which turns out to be only 5 percent of the use of the semiconductor. The other 95 percent is civilian.

In my home State, we have put together the laboratories and the industry, and talked for half a morning about why we are dropping behind. I thought that it was all going to focus on future research.

As a matter of fact, the meeting concluded with the industry saying they are better manufacturers than we are. Why doesn't somebody help us improve our manufacturing capability. We know enough. We have the science. But once it is invented, others manufacture it better. This is one example.

Another was a major American corporation that is involved every day in applied technology, and puts on the market hundreds of new products in the health care field annually. Until 18 months ago, that company had no knowledge that the national laboratories at Oakridge, Sandia, Los Alamos, and Livermore, were available to them for consultation.

Dr. Inman, you would be surprised to know that once they found out, they organized teams that go to each of the labs with their basic problems about a product. The scientists there engage in a day-long exchange with their scientists and applied researchers.

In one visit to one lab, they took 30 problems that were in the way of making a health-related product really competitive and superb. On the first visit, four product problems were solved out of 30. They believe that 20 more will be solved.

The problems are such things as an instrument that they want to sell that needs sterilization, but some part of it will not withstand the temperature of sterilization sufficient times over to make it a real marketplace product. In the first visit, that little piece that would not subject itself to the temperature in the repeated sterilization was solved just by talking with scientists at the lab.

PRODUCT PATENTS

Nonetheless, I submit to you that one of our really big problems with reference to defense research and civilian national laboratory research is the issue of technology availability on the patent end. This American system is built around a company getting a patent for a product and having preferential rights.

We have a national laboratory system that speaks as if they want to promote that, but we are extremely reluctant to do it because we have the notion that if we use tax dollars, why should your company get the product?

I believe we have to have a whole new policy in that area. First, the labs ought to be involved openly and affirmatively in technology transfer and consultative information exchange as an affirmative policy. Second, we must find some way to bridge this application of the technology problem on patents and copyrights, and the like, or we are really going to be spinning our wheels with reference to their capability.

Dr. Inman, you would be surprised to note that we are not moving forward on defense technology transfer this particular year. Because of the fear of secrets and the inhibition about spending public defense money for private sector development, there is a prohibition in an appropriation bill on technology transfer on defense-oriented research that is stronger than it was 2 years ago, rather than weaker.

It is only 1 year in duration, thank God, because it is in an appropriation bill, but we couldn't get it out of the bill. Instead of opening the exchange as you suggested, it is tightened.

This is a very long dissertation, but I want to compliment you for your testimony. I hope that this record is transcribed. I think the distinguished chairman will see to it that it is transcribed.

SUPERCONDUCTIVE MATERIAL

Super-conductivity is a very, good example. Scientists at Los Alamos and Sandia National Laboratories say that, right now, the Japanese are engaged in organized effort to find applications for this brand new, magnificent concept called "superconductive material." In the United States, we are watching and talking. We have no one around that we are aware of that is big enough or capable enough to look at applications, but the Japanese are.

It is our idea. It came from the labs and universities. It could change everything about the way we live. This could make many of our products obsolete, we all know that. It is just an absolutely incredible application even in the generic sense of it. But I don't know when we will, or how we will, focus on applications under the current diffusion of roles out there.

It is more than enough from my standpoint. I thank you for listening and thank you for your testimony.

Admiral INMAN. Senator Domenici, if I may respond to it, and again Professor Reich will have much more detail from having studied the problems for a long time.

I think that the National Laboratory problem, as you define it, is pretty well paralleled by the public universities. Private universities do better about deciding something can be patented. If they see a possible earning, and they can move much faster.

Both the national laboratories and the research institutions simply have not put in place the mechanisms to help push the technology they created out to be used. They are uncomfortable with how they deal with the whole issue of research results flowing out of publicly funded research.

CAPITAL FORMATION

Let me suggest a parallel problem, and that is on the issue of capital formation. I am just beginning to get acquainted with accounting rules that encourage industry to spin off new companies rather than plunging fast with a new technology.

They are worried, under the accounting rules, that if they run into an early problem, as you often do with a new technology, they will take a hit on the near-term profits that will show up right on the bottom line, and their stock price will fall rapidly. There is a whole range of problems across this society that go in the exact opposite direction from building this sense of urgency on focus on applications.

I worry both about the patent process, and about the food and drug process for approving gains in the biotechnology area. There clearly has to be a balance between protecting the national interest on one side, and speedy exploitation of the results on the other. We don't have that balance right now, and we need to rethink a lot of those issues.

DEMONSTRATION TECHNOLOGY CENTERS

Senator DOMENICI. Let me ask another question, and you can include it in your response, again by way of a statement.

Again, I refer to my day-long seminar, which I had Saturday, by coincidence, on this issue with some of America's best scientists. One scientist that I have the utmost confidence in said, "I don't think that we need 15 centers of excellence. We need to find out a way to establish some centers for demonstration technology."

You have been talking about that. Obviously, you are both saying that we have a lot of science out there. Where we fail is finding ways to apply it quickly. We succeeded for 30 years of industrialization, I assume you were saying this, Dr. Inman, because we didn't have any competition for the application of our scientific ideas. You did not say that, but you implied it.

Now we do, so we have the luxury of letting it fall out when it falls out. What is happening now is that somebody is picking it up before we can cause it to fall out. Basically it is West Germany and Japan, but it will be others pretty soon.

Would you agree that this is one of our areas of difficulty, and how would you put together a demonstration-type activity in that area?

Professor REICH. Senator, to the extent that the centers of excellence are geared to basic research, they are not going to be terribly helpful to

us for the two reasons that we talked about, that is, number one, basic research is not a major problem in the United States; number two, basic research tends to move, reaching Seoul, South Korea, as far as it reaches St. Louis.

The issue is the application of that basic research, that is our Achilles' heel. To the extent that those centers of excellence are concerned with applications, process technology, then we are so much the better.

There are a variety of ways that you might construct that. We have talked about demonstration projects. You can have a simple demonstration to the business community of how something works, but there is a whole gradient of more sophisticated possibilities with regard to, as we mentioned, research joint ventures, which allows businesses in the same industry, or small businesses, to come together, pool their resources, and actually try an application; or some sort of loan/grant system, which enables small business also to reduce the risk and cost of applying a new technology.

PATENTS

Let me just respond quickly to your point about patents, because I think that is a key problem. One of the reasons that the public has such a difficult time appreciating the importance of providing patents with regard to publicly funded research is that the public does not fully understand, and here is where perhaps the committee, among others, can provide some educational value.

The public does not understand that the applications process itself is risky and costly. Therefore, those who bear the cost and risk of utilizing a new breakthrough have got to have some guarantee that for some period of time, they can enjoy the fruits of that investment.

The key here is insuring competitive bidding with regard to the patent. As long as there is competitive bidding for that license, for that new breakthrough, then you can be sure that the price of that license will be pushed down to just the point at which it is still worthwhile for a company to take that risk in cost, but it is not making access profits off of the public.

If you could stress competitive bidding with regard to the national laboratories, with regard to publicly funded research in universities, then I think that some of the public concern, at least that portion that is a legitimate business concern, would be reduced.

Senator DOMENICI. Thank you, Mr. Chairman.

Chairman STENNIS. I thank you.

Gentlemen, let me say again with emphasis, I have a few questions I would like to ask.

Let me ask a question here to indicate what I am striking at, and I will address this to each of you, if I may.

LOSS OF U.S. COMPETITIVENESS

Is the loss of U.S. competitiveness the reason for the increase in the trade deficit, or was the trade deficit caused primarily by other policies which brought to light the on-going problem of U.S. competitiveness?

It seems to me that these are two clear-cut questions. I will repeat part of it. Is the loss of U.S. competitiveness the reason for the increase in the trade deficit? What is your answer to that?

Admiral INMAN. Mr. Chairman, a lot of factors have contributed to the loss, but I believe overwhelmingly that the direct contributing cause has been declining U.S. productivity, and the fact that we have not focused on keeping quality in our products, and that we have not moved them to the market in a timely way.

Chairman STENNIS. Professor, what is your response, please?

Professor REICH. I would say, Senator, much the same thing. The trade deficit is a symptom of our problems. It is not the cause, it is a symptom. The fundamental cause, just adding a bit to what Admiral Inman said, is twofold. We spend too much, both in the public and private sectors, given how productive or competitive we are.

In other words, if we were producing more and they were better quality, and they sold for more in world markets, we could stay at the level of consumption and living standards we now have. But given that we don't produce as much and of high quality that others around the world are willing to pay a lot for, we are living too well.

Therefore, in order to reduce the trade deficit and, indeed, the debts of the rest of the world, the choice is clear. We either live less well, or we become much more productive and create much better products and services that the rest of the world wants.

FEDERAL SPENDING ON EDUCATION

Chairman STENNIS. Let me just ask this for the record now, this short question. Should spending by the Federal Government on education be increased, particularly spending on science, the educational field of science?

It is a broad question. We are proposing to reduce that field of spending some, we are trying and reduce virtually everything now, to get the budget somewhere near balance. How do you answer that?

Should we go on now to increase the spending or decrease it in this field, or any major field of education?

Admiral INMAN. Mr. Chairman, I spent 31 years in government service. I have now spent almost 5 years in the private sector. I have not been in the education business for a lot of years. But I am persuaded, as I said in my earlier statement, after a long look at this whole competitiveness issue, that education is the frontline.

I don't believe that we can afford to cut back in the broad level of investment in the country in education. I think that it needs to go up. What I am not sure of is how much of that needs to go up by the States or the localities as compared to what is done by the Federal Government.

I believe very strongly that we need more grants for graduate studies for U.S. students, and that the country prospered when we had it. We have cut back on it sharply, and we need to reverse that trend.

If you gave me the options, in tough budget times of how many centers of excellence I would create, I would clearly go for the ones that worked on applications. But rather than more centers for basic research, if the limit were there on the dollars, I would take the money and put it out for grants for graduate students to again fuel and keep building the pool of talent that we are going to need to draw on on a whole range of issues.

Senator Stennis. All right, Professor, what is your response?

Professor REICH. Senator, let me begin with a general statement. We are living right now in a world economy in which every factor of production is now capable of moving around the world at an extraordinary speed. Money is now almost completely internationalized. Basic technology can move anywhere. Entire factories can be set up anywhere around the world. There is only one factor of production that is relatively immobile internationally and, therefore, on which the future of our competitiveness, the future of our standard of living rests, and that is our people. Their skills, the abilities, their ability to work together, their capacities. Education is absolutely central to the challenge.

When you think that one third of our 18-year olds in this country don't finish high school, and 20 percent of them are functionally illiterate, you have to worry fundamentally about our ability to compete internationally and maintain our standard of living.

I would place emphasisupon math and science. I think that in math and science, we are falling way behind. Most of the standardized tests, you have seen the results, as have I, show that American math and science education, relative to foreign math and science education, is very bad.

In addition, I would emphasize language, not just helping young children who don't speak to speak better English, read and write better English, but also our extraordinary inability to speak foreign languages.

For every American that speaks Japanese, there are 15 Japanese that speak English. With that kind of ratio, there is no conceivable way that we are going to be able to take advantage of whatever technologies the Japanese have, that we are going to be able to be strong world traders. Again, language, and science and mathematics are two central challenges for our educational system.

Professor REICH. My last point, Mr. Chairman, was that the fact that for every American that speaks Japanese, 15 Japanese speak English, itself works against any ability to market our products, and also our ability to learn from the Japanese about their technologies. So foreign languages, the ability to speak foreign languages is a critical gap in our educational system. I would place that second behind math and science.

Admiral INMAN. Senator, if I may add on the point about the dropouts. One of the things that I have found particularly stunning and distressing in looking in Texas, where I now live, a very large prison system, overcrowded prisons, problems as to how we fund and maintain them. Nine out of ten inmates in the Texas prison system are school dropouts. Clearly, we end up paying one way if we don't pay another.

The effort that we can make in education to keep them in school, to keep them on a track toward being able to hold jobs and giving them the skills later to retrain for jobs is a long-term investment that makes this society a lot better one. It is not do-goodyism, it is just looking out for our long-term national interests.

Chairman STENNIS. All right, Senator Domenici, I recognize you for further questions.

TRANSLATION OF TECHNOLOGICAL DOCUMENTS

Senator DOMENICI. Dr. Inman, you discussed the translation of technology and technological documents as one area that we ought to address. Maybe I have lived here too long, but when I hear an interesting idea, I immediately think of it in terms of Congress.

I wonder if you would agree with me that if we are going to have some technology centers, it may be, from your testimony, that an idea for a piece of legislation has evolved. I wonder what you would think about us permitting to be created by statute a non-profit center for technology translation. We could create it by national statute, and then let them establish user fees for those who want to use it. It would seem to this Senator that you could focus this activity in one place.

On our language deficiency, there is no use kidding ourselves. American corporations do not have Japanese interpreters around, but we could have one center for all language translation, and not do it free. Establish a board and let them charge American universities or corporations for the translations, but charge them with assimilating it. Does that make sense?

Admiral INMAN. I like the idea, Senator Domenici. My understanding is that less than 5 percent of the Japanese technical literature is ever translated into English. There have to be a lot of ideas there. There has to be a lot of understanding of applications that could, again, be of broad use here.

I like the idea of doing it in a non-profit environment. I would want to work to try to work to keep the cost as low as possible, again, thinking of the small business entrepreneur, in whom I am particularly interested, to be able to access that. The large corporation could afford the commercial service. We want to keep the cost down.

I think that we ought not to overlook some kind of effort to try to persuade the Japanese that they ought to cover some of the cost of that translation as one of the ways that we help rebalance trade.

Senator DOMENICI. Doctor, do you think that has some merit?

Professor REICH. I think that it has a great deal of merit, Senator. Perhaps I am going to be sounding very much like a typically conservative economist right now, but I would urge that before we committed funds to that, it might be useful to ask GAO, or perhaps OTA, to try to find out the extent to which there are such services in the private sector and why they have not been utilized, if, in fact, they have not been utilized as much as they should by the private sector.

Admiral Inman talks about less than 5 percent of the documents being translated, that strikes me as remarkably poor performance by the business community in terms of the business community recognizing how useful and important many of these documents are.

On the demand side, we have to worry, because if the demand is not there, if American business doesn't understand how important these are, it is not going to help that we subsidize the creation of these documents.

Admiral INMAN. I guess that is why I would like the Japanese to subsidize it at the outset, rather than our own.

There is that not-invented-here syndrome, but from my MCC experience, where I was very vitally interested in what they were doing, I found the translation services are terribly expensive. When you are operating under relatively constrained budgets, either at a non-profit or low profit, there is a great reluctance to pay the cost.

I think that there are very few U.S. corporations that do, in fact, fund and understand a lot more broadly what is going on. There was a small program a year ago, I think about $1 million, that was put in the Commerce budget. My third-hand understanding is that it has been handled in a bureaucratic manner, and not much has come out of it.

PROCESS TECHNOLOGY

Senator DOMENICI. I only have one last question, and I don't want to belabor it, other than I want to ask you this question one more time. Then, if both of you could, try to put a little more flesh on this skeleton and answer with a little more detail.

I am convinced that we are going to create new centers of scientific excellence because everybody is for them. I am not against them. I think that your testimony here today is superb. It is not going to bridge the competitiveness gap. It might enhance and add to some great universities becoming greater, and more students, which, in the long-term, might all be fine.

I am convinced, from everything that I have heard, that our shortcoming is in the applications. Doctor, you used the words "process technology." Frankly, what I think we need, if we are going to move in that direction, is some explanation of what that kind of joint venture would do that isn't currently being done.

How would you verbalize it in contrast with the simplicity that we will use in creating a center of science excellence in genetics. We don't need many more words than that, other than to say, it shall be run by NSF, if that is what the Congress wants, and it shall involve universities and the private sector. There you have a center, and I have just about written the statute, put some dollars on it, and require some matching funds.

I don't know how to verbalize what I am convinced is the shortcoming, and that is the process of moving from science to applications, which the Japanese are beating us at, partly because of the way their businesses are set up. They are integrated vertically.

If you look at where NEC, the largest semi-conductor company in the world is, you can hardly find it in a map or diagram of the major company that owns it. That same company owns the major bank, the major automobile manufacturer, the new steel mills, and there sits NEC which produces more semi-conductors than anyone in the world. We don't have that in America. So that whole institution is going to respond to applications through that little entity, and we, somehow, are not going to get there quick enough.

In my mind, I understand an applications-type center, or a process-type center. I think that we could sell it around here, if you and others could help us verbalize it. How would it be joint ventured? What kind of consortium could we put together? I assume that you have already concluded that it would have the national labs and the universities and the private sector from what you have said.

Would you want to do that today, or would you want to write something up for us, if the chairman agrees?

Professor REICH. If you don't mind, I could summarize now, and then I could follow up with a more detailed description. I am sure Admiral Inman also has a variety of views on this.

APPLICATIONS

I don't, first of all, want to suggest to you that when I talk about manufacturing process technology that we are talking simply about the manufacturing process itself, or even about capital goods. We are talking more broadly, including the creation of new products, the work that has to be done by a business in foreseeing a potential market for a particular application. All of that we bundle, or I bundle, under the term "applications."

What is the particular model for appropriate applications? It probably is going to depend to some extent on the industry and on the technology. There are some crude rules of thumb. For example, in the semiconductor industry, we see right now an effort to create a joint venture around manufacturing process technology that would enable the semiconductor industry to perfect the manufacturing of advanced semiconductors.

There is a great deal of discussion right now in the semi-conductor industry of what that prototype would look like. The disputes, and I think that it is fair to characterize it as a dispute, centers on whether that needs to be only a demonstration, that is, a small scale replica of what kind of process technology could be developed or should be developed in which breakthroughs, therefore, can be spun out to individual companies, or whether it has to be a full scale, large scale manufacturing center itself. Various companies have taken different positions.

I think that the answer there ultimately does have to depend on the particular industry and the particular technology.

Second, let me say that there are a number of problems in the private sector having to do with the organization of our capital markets,

the organization of the private sector, which also militates against rapid commercialization and applications of new technologies. Manufacturing continues to have a relatively low status among business people.

I know that at my university, for example, the best and the brightest, to use an overused term, do not go into manufacturing. They go, for the most part, into finance, into investment banking. If they can't make it into investment banking, they go into corporate law. There are reasons for this.

Our society provides extraordinary remuneration for those bright young people that go into finance, but there is an extraordinary cost to society as well. We are not getting the best and the brightest in process technologies and manufacturing, and management manufacturing.

I might add, by the way of footnote, that we have a second brain drain in the country, and that is that seven out of ten of our top engineers graduating with Ph.Ds are going into defense-related work. There are spinoffs, but that, let's be frank about it, is a form of brain drain with regard to the applications we are talking about.

Secondly, and I will end on this point, in the private sector, the cost and risk of undertaking fundamentally new applications is relatively high. Many companies, looking at their bottom lines, worrying about the financial markets, worrying about being taken over, if they don't show a healthy return, are reluctant to make those kinds of fundamentally new investments in process technology, capital goods, incorporating brand new product ideas.

It is far safer for them to wait, wait until somebody takes the leap. If it looks like it is a good product, then get it. But the somebody else, these days, is often the Japanese, and by that time, to be the follower, when the Japanese are the first entrants, it means that the ball game is over.

Admiral INMAN. I have finally found one single area in which I have a slight disagreement with Professor Reich, and that is in the description of 70 percent of the talent flowing being a brain drain.

I view the problem as not in the talent that is working on the defense research, but on this process that we have put in place that keeps the fruits of that from being available for commercialization for so many years.

In direct response to your question, Senator Domenici, I would like to send for the record. One, I don't have well developed ideas of my own in response to what that center might look like. But I have come to have great regard for the views of Professor Bill Tessar, now at the University of Texas at Austin, who has spent a lot of time looking at this issue and thinking about it. I want to draw on his talent in looking for my response to your question.

Senator DOMENICI. Thank you very much.

Thank you, Mr. Chairman.

Chairman STENNIS. Senator, thank you.

CONCLUDING REMARKS

Gentlemen, you are very generous with us, indeed, with your time.

I just feel that your testimony is highly valuable. It will be considered by numbers and numbers of people, and it will have some influence on these problems that relate to the economy and related matters.

I never have given much attention to scientific development. I wish I had. I would have been a better citizen. I realize it here now inasmuch as this quandary we are in, and have been in for several years, trying to have better control of the budget, have better control of our economy and trade values, and so forth. You have certainly made your contribution in that field, I know.

We are most grateful, and if there is anything that you wish to add—this will be an overall question—either one of you, because we are very definitely interested in your opinion on these matters.

Professor REICH. No, I have nothing further to add at this point, Mr. Chairman.

Admiral INMAN. Mr. Chairman, I have nothing further to add, I just want to make a personal note, if you will forgive it.

Chairman STENNIS. Go ahead.

Admiral INMAN. After 5 years away, it is good to see you here hale and hearty. I would note that there are a great number of people, an awful lot younger than you are, who think that they already have all the answers. I take a lot of heart that you are still probing for new ones.

Thank you very much.

Chairman STENNIS. We thank you very much. We consider this some of the most important testimony we have had here over the years.

I want to reintroduce the Senator from New Mexico to you. He came here a few years ago. He would have liked to have taken over in the first year. He was well-versed, well-trained, a hard worker who never gives up. He made quite a difference around here.

I feel that your testimony will make some difference far beyond this place.

Again, thank you very much and we look forward to having you back next year, if not before.

COMMITTEE RECESS

The committee will take a recess now, subject to the call of the Chair.

[Whereupon, at 11:45 a.m., Tuesday, May 5, the hearing was concluded, and the committee was recessed, to reconvene at the call of the Chair.]

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